

Plasticizer poly vinyl chloride composition

Field of the Invention

The invention relates to plasticized poly vinyl chloride compositions comprising at least one poly vinyl chloride resin and a special plasticizer compounded with said at least one poly vinyl chloride resin.

Description of the Related Art

WO 01/98404 discloses a plasticized vinyl chloride composition comprising (a) at least one vinyl chloride resin and (b) a plasticizer compounded with (a) wherein said plasticizer comprises a fatty acid product derived from a vegetable oil having at least 80% by weight of unsaturated fatty acids, wherein said fatty acids are substantially fully esterified with a monool or a polyol, and said esterified unsaturated fatty acids have been substantially fully epoxidized.

In an article entitled "Use of esterified rapeseed oil as plasticizer" in plastics processing" by Johannes Wehlmann it is mentioned that in most cases phthalic acid esters, especially dioctyl phthalate (DOP), are used as plasticizers for poly vinyl chloride (PVC) resins (see **Fett/Lipid 101, 1999, No. 6, pages 249-256**). However, phthalate plasticizers are criticized because of their environmentally harmful action. The author then describes the use of rape methyl ester as plasticizer.

Detailed Description of the Invention

It was an object of the present invention to provide plasticizers for plastics, especially PVC, which overcome the difficulties and disadvantages of the plasticizers of the prior art. It was a further object of the invention that PVC plastisol formulations based on these plasticizers show a reduced viscosity compared with formulations based on phthalic ester type plasticizers like dioctyl phthalate (DOP). As it is known to the artisan plastisols are dispersions of plastics, especially PVC, in plasticizers.

According to the invention this is achieved by **plasticized poly vinyl chloride compositions** comprising (a) 100 parts by weight of at least

one poly vinyl chloride resin and (b) 0,1 to 200 parts by weight of a plasticizer compounded with said at least one poly vinyl chloride resin, wherein said plasticizer comprises (i) esters of fatty acids with 8 to 14 carbon atoms and isobutanol with the proviso that the fatty acids can be saturated or olefinically unsaturated, linear or branched and contain at least one epoxy group per molecule and (ii) one or more methyl esters of fatty acids with 16 to 18 carbon atoms with the proviso that these fatty acids can be saturated or olefinically unsaturated, linear or branched.

In a preferred embodiment of the invention the plasticized poly vinyl chloride compositions are free of phthalic ester type plasticizers and especially free of dioctylphthalate (DOP).

In another embodiment of the invention the weight ratio of compounds (i) and (ii) is within the range 90 : 10 and 50 : 50 and especially within the range 65 : 35 and 55 : 45.

The invention also relates to **plasticizer compositions** for poly vinyl chloride resins comprising (i) esters of fatty acids with 8 to 24 carbon atoms and isobutanol with the proviso that the fatty acids can be saturated or olefinically unsaturated, linear or branched and contain at least one epoxy group per molecule and (ii) one or more methyl esters of fatty acids with 16 to 18 carbon atoms with the proviso that these fatty acids can be saturated or olefinically unsaturated, linear or branched. Preferably these plasticizer compositions are free of dioctylphthalate. In one embodiment these plasticizer compositions contain compounds (i) and (ii) in an amount that the weight ratio of compounds (i) and (ii) is within the range 90 : 10 and 50 : 50 and especially within the range 65 : 35 and 55 : 45. In another preferred embodiment these plasticizer compositions contain exclusively compounds (i) and (ii).

The invention also relates to the **use** of compositions comprising (i) esters of fatty acids with 8 to 24 carbon atoms and isobutanol with the proviso that the fatty acids can be saturated or olefinically unsaturated, linear or branched and contain at least one epoxy group per molecule and (ii) one or more methyl esters of fatty acids with 16 to 18 carbon atoms with the pro-

viso that these fatty acids can be saturated or olefinically unsaturated, linear or branched **as plasticizers for poly vinyl chloride resins**. As stated above the compositions are preferably free of are free of phthalic ester type plasticizers.

5 As also stated above the compositions preferably contain compounds (i) and (ii) in an amount that the weight ratio of compounds (i) and (ii) is within the range 90 : 10 and 50 : 50 and especially within the range 65 : 35 and 55 : 45. Those compositions which exclusively contain compounds (i) and (ii) are preferred for the use as plasticizers for poly vinyl chloride resins.

10 **Examples**

IES = Isobutyl epoxy stearate

IFAME = Mixture of methyl esters of fatty acids. The distribution of the fatty acid individuals in these methyl esters was (% means mole-%):
15 Straight chain C12 = 0.3%, branched chain C14 = 0.4%, straight chain C14 = 1.0%, branched chain C16 = 3.7% , straight chain C16 = 4.9%, branched chain C18 = 61.4%, straight chain C18 = 4.6%, cyclic C18 = 17.5%, straight chain C20 = 0.1%, aromatic C18 = 6.1%.

Filler = Calcium Carbonate (Calcit)

Stabilizer = Stabiol CZ 3083 (Liquid Ca/Zn Stabilizer commercially available from COGNIS)

20 **PVC** = Poly vinyl chloride produced by emulsion polymerization (Solvic 374 MB commercially available from SOLVAY)

Example 1

(PVC Ball formulation)

25 The following compounds were mixed together in a conventional mixer:

PVC	100 phr
IES	60 phr
IFAME	40 phr
30 Filler	90 phr
Stabilizer	1 phr

 The abbreviation phr means "parts per hundred resin" and is

known to the man skilled in the art.

The viscosity of the formulation was measured according to Brookfield (Spindle 5 at 20 rpm). It was 36.000 cps. The value of the viscosity is much lower compared to the formulation of comparative example 1 which is based on dioctyl phthalate as plasticizer.

The formulation was then transferred into a ball by rotational moulding at 180 °C. The shore A hardness of the ball was measured. It was 54,8. The value of the shore A hardness is nearly the same as the shore A hardness of the ball in comparative example 1. This shows that the IES/IFAME mixture is as good as plasticizer as the "classical" dioctylphthalate.

Comparative Example 1

(PVC Ball formulation)

The following compounds were mixed together in a conventional mixer:

PVC	100 phr
dioctyl phthalate	100 phr
Filler	90 phr
Stabilizer	1 phr

The viscosity of the formulation was measured according to Brookfield (Spindle 7, 5 rpm). It was 125.400 cps

The formulation was then transferred into a ball by rotational moulding at 180 °C. The shore A hardness of the ball was measured; it was 54,0.

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